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Thermopyhsical conditions for the onset of a core dynamo in Vesta

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Recently, a study on the magnetization of the eucrite meteorite Allan Hills A81001 [1] has suggested the possibility that, in its primordial history, Vesta had an active core dynamo. The magnetic field associated could have preserved Vesta from the space-weathering.
In this work, using a parametrized thermal convection method, we verified the thermophysical conditions for the onset of a core dynamo. The starting point is a post-differentiated structure [2,3,4], made of a metallic core, silicate mantle and rocky crust. We explored four different fully differentiated configurations of Vesta [5], characterized by different chondritic composition, with the constraints on the core size and density provided by [6]. We also explored three different scaling laws for the core velocity (mixing-length theory, MAC and an intermediate case). Core and mantle have both a temperature-dependent viscosity, which is the parameter that largely influences the magnetic Reynolds number and the dynamo duration.
Our results suggest that Vesta had an active dynamo, whose duration lies in the range 150-500 Myr and the more appropriate scaling law for the core velocity is that given by the mixing-length theory.
The maximum strength of the primordial core magnetic field is compatible with the estimations provided by [1].
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